HATCHERY EVALUATION REPORT

Washougal Hatchery - Coho (Type N)

February 1997

Integrated Hatchery Operations Team (IHOT)

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Washougal Hatchery - Coho (Type N)

An Independent Audit Based on Integrated Hatchery Operations Team (IHOT) Performance Measures

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Section 1

Executive Summary

This report presents the findings of the independent audit of the Washougal Hatchery - Coho (Type N) program. The hatchery is located along the Washougal River about 16 miles north of the town of Washougal, Washington. The hatchery is used for adult collection, incubation, and rearing of tule fall chinook and late coho (N type).

The audit was conducted in 1996-1997 as part of a 2-year effort that will include 67 hatcheries and satellite facilities located on the Columbia and Snake River system in Idaho, Oregon, and Washington. The hatchery operating agencies include the U.S Fish and Wildlife Service, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, and Washington Department of Fish and Wildlife.

Background

The audit is being conducted as a requirement of the Northwest Power Planning Council (NPPC) "Strategy for Salmon" and the Columbia River Basin Fish and Wildlife Program. Under the audit, the hatcheries are evaluated against policies and related performance measures developed by the Integrated Hatchery Operations Team (IHOT). IHOT is a multi-agency group established by the NPPC to direct the development of new basinwide standards for managing and operating fish hatcheries. The Bonneville Power Administration (BPA) contracted with Montgomery Watson to act as an independent contractor for the audit.

IHOT has established five basic policies that cover: (1) hatchery coordination, (2) hatchery performance standards, (3) fish health, (4) ecological interaction, and (5) genetics. The audit focuses on all these policies, with the exception of hatchery coordination. These policies are set forth in *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1995).* That document is the source for the performance measures that are the basis of this audit.

The Audit Process

The audit was based on the facility management's response to a 109-page questionnaire. This audit form was completed through a five-step process in which:

- Information was obtained from headquarters.
- The hatchery manager was asked to fill out and return the audit form.
- A 1-2 day site audit visit was conducted to inspect facilities, review hatchery records, discuss audit form responses, and develop remedial action plans.
- A compliance report was developed to document the compliance status of each performance measure. This report was then shared with the hatchery manager and IHOT representative.

This hatchery evaluation report was written to document compliance with IHOT performance measures and develop cost estimates for remedial actions when needed.

Washougal Hatchery - Coho (Type N) Results

The Washougal facility includes one pond for adult holding, 24 concrete raceways, 3 earthen ponds, and incubation facilities. The Washougal Hatchery was authorized under the Mitchell Act and began operating in 1959 as part of the Columbia River Fisheries Development Program - a program to mitigate for fishery losses caused by hydroelectric system development. The goal of the hatchery is to produce lower river fall chinook and coho that will contribute to NE Pacific and Columbia River Basin commercial and sports fisheries while providing adequate escapement for hatchery production.

The Washougal Hatchery - Coho (Type N) program was in general compliance with most of the performance measures. In the area of program objectives, the hatchery was not meeting its adult return goal and needed to document its adult contribution and smolt-to-adult survival. The audit found that the hatchery was not in compliance with the temperature criteria, water quality monitoring requirements, acclimation facilities, and pathology-free water criteria, which are all facilities requirements. The hatchery was also not in compliance with the feed preparation tests, flow for incubation criteria, and loading criteria for rearing. The hatchery needed to develop specific incubation and rearing standards for the IHOT Operations Plan. The hatchery did not have a Genetics Monitoring and Evaluation Program.

The specific areas in which the Washougal Hatchery - Coho (Type N) program requires remedial actions based on the IHOT performance measures are listed below. These remedial actions are listed in alphabetical order without intent of ranking or otherwise assigning priority:

- Conduct IHOT QA/QC tests for feed preparation
- Develop an approved genetics M&E plan
- Develop smoltification goal and monitor
- Develop specific incubation and rearing standards for the IHOT Operations Plan
- Document compliance with the adequacy of transportation systems to meet IHOT requirements
- Follow IHOT criteria for incubation flow or revise criteria
- Follow IHOT protocols for disinfection of vehicle interiors and exteriors
- Improve fry-to-smolt survival
- Improve smolt-to-adult survival
- Monitor TGP and record
- Provide 2,000 gpm more water to earthen ponds 25, 26 and 27
- Provide acclimation facilities for fish released in the Klickitat River
- Provide disease-free water for incubation and early rearing
- Provide documentation of water temperature in the transportation unit
- Provide documentation on inspection and service of the transport truck/chassis and tank/unit prior to the release season
- Provide telephone pagers for staff
- Review IHOT temperature criteria for spawning and rearing
- Run analysis for water chemistry parameters, turbidity, alkalinity, hardness, nitrite, and contaminants

Non-compliance issues resulting from items beyond human control or Performance Measures not relevant to this hatchery (Type 1 in Table 3, Section 4 of this report) were not listed above.

Section 2

Facility Description

Name: Washougal Fish Hatchery

Stock/Species: Tule Chinook
Coho (Type N)

Operating Agency: Washington Department of Fish and Wildlife

Funding Agency: Mitchell Act (NMFS)

Location: The hatchery is located along the Washougal River about 16 miles north of the town of Washougal, Washington.

Address: 15632 Washougal River Road
Washougal, WA 98671

Hatchery Manager: Mr. John Norton

Phone: (360) 837-3311
Fax: (360) 837-3996

Purpose: The Washougal Hatchery was authorized under the Mitchell Act and began operating in 1959 as part of the Columbia River Fisheries Development Program - a program to mitigate for fishery losses caused by hydroelectric system development. The goal of the hatchery is to produce lower river fall chinook and coho that will contribute to NE Pacific and Columbia River Basin commercial and sports fisheries while providing adequate escapement for hatchery production.

Production Goal:

Tule Fall Chinook

Produce 6 million subyearlings for on-station release.

Provide 500 eggs/fish to co-op programs

Provide eggs/fish to other facilities

Coho (Type N)

Produce 500,000 yearlings for on-station release

Provide 220,000 eggs/fish to co-op programs

Produce 2.5 million yearlings for release into the Klickitat River as per U.S. v. Oregon Agreement

Water Supply: Water rights total 15,061 gpm from four sources: Washougal River Bob Creek, Boyle Creek, and C-Creek

Facilities:

Adult Holding:	1 asphalt-lined adult pond - 100,825 cf
Incubation:	72 full-stack vertical tray incubators - 1,152 trays
	4 deep troughs
Early Rearing:	2 shallow troughs
Raceways:	12 concrete raceways - 5,000 cf each
	12 concrete raceways - 8,750 cf each
Rearing Ponds:	1 earthen pond, Pond 25 - 100,000 cf
	1 earthen pond, Pond 26 - 120,000 cf
	1 earthen pond, Pond 27 - 420,000 cf
Satellite Facilities:	None

Section 3

Compliance Status

The hatchery audits are based on compliance with written IHOT performance measures. These performance measures are documented in ***Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries*** (referred to as *IHOT 1995* in this report).[1] The purpose of the performance measures is to implement new basinwide policies that provide regional guidelines for operating anadromous hatcheries in the Columbia Basin.

The audit focuses on performance measures for IHOT policies that cover (1) hatchery performance standards, (2) fish health, (3) ecological interaction, and (4) genetics. These performance measures are intended to guide hatchery operations once production is established. For that reason, the hatchery operations audit included broodstock collection, spawning, incubation of eggs, fish rearing and feeding, fish release, equipment maintenance and operations, and personnel training. Production priorities are beyond the scope of this audit.

Based on *IHOT 1995*, a detailed 109-page audit form was developed. The audit form divided the performance measures into six major sections along major program and technical criteria areas. Two additional sections (sections 1 and 8) include general information and expenditure information needed for this Hatchery Evaluation Report and blank forms for additional comments. The following is the basic structure of the IHOT audit form:

Section 1	Performance Measures for General Information and Expenditure Information (PMs General 1-2)
Section 2	Performance Measures for Program Objectives (PMs 1-4)
Section 3	Performance Measures for Facility Requirements (PMs 5-15)
Section 4	Performance Measures for Hatchery Practices (PMs 16-25)
Section 5	Performance Measures for Fish Health Policy (PMs 26-34)
Section 6	Performance Measures for Ecological Interactions (PMs 35-38)
Section 7	Performance Measures for Genetics Policy (PMs 39-43)
Section 8	Blank Forms for Additional Comments.

Several performance measures are repeated in various sections of the audit form. These performance measures overlap in *IHOT 1995* and were retained to allow individuals interested in specific portions of the audit (such as Genetics or Fish Health) to determine the compliance status of all performance measures for a given topic in one location. A repeated performance measure is indicated by shaded text.

The Hatchery Audit Process

The hatchery audit will be conducted over a 2-year period that concludes in 1997. At each hatchery, a five-step process was used to complete the overall hatchery audit. This process consisted of research and onsite visits. The site visit at the Washougal Hatchery was conducted February 6, 1997.

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[1]Integrated Hatchery Operations Team (IHOT) 1995. *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries*, Bonneville Power Administration, Portland, Oregon.

The following is the five-step audit process:

1. Information was obtained from headquarters.

2. The hatchery manager was asked to fill out and return the **Audit Form**.

3. A 1-2 day site audit visit was conducted at each hatchery. During that visit an audit team inspected facilities, reviewed hatchery records, discussed audit form responses, and developed remedial action plans when appropriate.

4. During the site visit, the compliance status of each performance measure was discussed with the hatchery manager and IHOT representative. A portion of the Hatchery Evaluation Report was sent to the hatchery manager following the audit visit as a **Compliance Report**. That Compliance Report is Table 2 of this report.

5. Information from steps 1-4 was used to prepare a draft **Hatchery Evaluation Report**. This draft report was submitted to the operating agencies for review of the information used to determine compliance. Based on review and comments, a final Hatchery Evaluation Report was developed. The final report documents the compliance of a particular hatchery with the IHOT performance measures and presents cost estimates to correct any deficiencies.

Compliance Status of Washougal Hatchery - Coho (Type N)

The following table includes information on life-stages that are held on this facility for some portion of their rearing cycle (Table 1). For multi-facility programs, summary cost and contribution data is presented at the facility where rearing occurs. For the compliance status relating to performance measures that do not occur at this hatchery, please refer to the Hatchery Evaluation Reports for the hatcheries and stocks listed in Table 1. A check mark (✔) indicates that the specific life-stage is held at this facility.

This section documents the compliance status of the Washougal Hatchery - Coho (Type N) program. Each performance measure is presented in a table taken from the audit form (Table 2). The compliance status is identified by the following categories:

- **N/A** (not applicable)
- **Yes** (in compliance)
- **?** (unknown; generally due to unavailability of information to determine compliance)
- **No** (not in compliance).

Remedial actions are suggested for performance measures not in compliance. These remedial actions are grouped into categories and listed in Section 4 of this report, where the cost of the required remedial actions is also presented.

Table 1 Summary Program Information for Washougal Hatchery - Coho (Type N)

Component	Location of Adult Holding, Spawning, Incubation, and Rearing					
	Washougal Hatchery	Lewis River Hatchery (Backup)				
Adult Collection	✔	✔				
Adult Holding	✔	✔				
Spawning	✔	✔				
Fertilization	✔	✔				
Incubation						
green-to-eyed	✔	✔				
eyed-to-hatch	✔					
Rearing						
fry	✔					
fingerlings	✔					
smolts	✔					
Acclimation/release	✔					

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
the hatchery programs outlined in a subbasin nagement plan?		✔			Columbia Basin System Planning Production Plan, Mitchell Act, and Columbia River Development Plan	
ne hatchery operating under a current hatchery rational plan? s it understood by staff? s it being followed?		✔ ✔ ✔			IHOT Operations Plan and Washougal Operation Manual	
hatchery monitoring and evaluation plan in place? Do you have a written monitoring and evaluation plan?		 ✔			 CWT and Missing Groups Report	
ult contribution to fisheries, spawning grounds, and chery		✔			Review of records. Spawning ground contribution not available.	
ult pre-spawning survival as compared with blished goal		✔			Review of records; in compliance 5 out of last 5 years	
-take as compared with established hatchery goal				✔	Review of records; in compliance 3 out of last 5 years	Improve adult returns
en-egg to eyed-egg survival as compared with blished goal		✔			Review of records; in compliance 5 out of last 5 years	
d-egg to fry survival as compared with established l		✔			Review of records; in compliance 5 out of last 5 years	
to smolt survival as compared with established goal				✔	Review of records; in compliance 4 out of last 5 years. Low temperature problems can reduce survival.	Improve fry-to-smolt survival
duction as compared with established goal		✔			Review of records; in compliance 3 out of last 3 years	
cent survival (smolt to adult) as compared with blished goal			✔		Review of records; in compliance 1 out of last 4 years	Improve smolt-to-adult survival
nber of eggs, fry, fingerlings, smolts, and/or adults neet basinwide needs		✔			Review of records/Discussion. Meets needs with exception of eggs.	None

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
nperature						
Does your water temperature meet the criteria for spawning?				✔	Review of records/Discussion	Review IHOT temperature criteria for spawning
Does your water temperature meet the criteria for ncubation?		✔			Review of records/Discussion	
Does your water temperature meet the criteria for earing?				✔	Review of records/Discussion	Review IHOT temperature criteria for rearing
solved gases						
s the oxygen level near saturation?		✔			Review of records/Discussion	
s the dissolved nitrogen level less than saturation?			✔		No data	Monitor TGP and record
emistry						
mmonia (un-ionized)			✔		No data	Run analysis
arbon Dioxide			✔		See above	See above
hlorine			✔		See above	See above
H			✔		See above	See above
opper			✔		See above	See above
ydrogen Sulfide			✔		See above	See above
on			✔		See above	See above
inc			✔		See above	See above
bidity						
Does your turbidity meet the criteria?			✔		No data	Run analysis

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
alinity and hardness						
)oes your alkalinity and hardness meet the criteria?			✔		No data	Run analysis
:ite						
)oes your nitrite meet the criteria?			✔		No data	Run analysis
:ontaminants						
ıldrin			✔		No data	Run analysis
ndrin			✔		See above	See above
)ieldrin			✔		See above	See above
Heptachlor			✔		See above	See above
:hlordane			✔		See above	See above
Methoxychlor			✔		See above	See above
ıindane			✔		See above	See above
Malathion			✔		See above	See above
;uthion			✔		See above	See above
hogens						
Vhat portions of the hatchery have disease-free water?						
Adult holding				✔	Inspection of facilities/Discussion	None
Incubation				✔	Inspection of facilities/Discussion	Provide disease-free water for incubation and early rearing
Early rearing				✔	Inspection of facilities/Discussion	See above
Rearing				✔	Inspection of facilities/Discussion	None
Others				✔	Inspection of facilities/Discussion	None

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
rm Systems						
)o the following areas have alarms?						
Intake		✔			Inspection of facilities/Discussion	
Large rearing ponds and adult holding ponds		✔			Inspection of facilities/Discussion	
Raceway headboxes and rearing ponds		✔			Inspection of facilities/Discussion	
Incubation facilities		✔			Inspection of facilities/Discussion	
Quarantine areas and facilities	✔				No quarantine areas and facilities	
Water treatment systems	✔				No water treatment systems	
Security				✔	Inspection of facilities/Discussion	Install security alarms
ıre there outside systems and buzzers in onsite esidences?		✔			Discussion	
ıre water flow alarms checked daily?		✔			Review of records/Discussion	
ıre all other alarms checked weekly?		✔			Discussion	
; there a log of alarms for emergencies, tests, and ıaintenance requirements?		✔			Review of records/Discussion	
ıre telephone pagers used?				✔	Discussion	Provide telephone pagers for staff
ılt collection and holding facilities						
)o you meet the adult holding criteria?		✔			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ıbation facilities						
'ype 1: Vertical tray)o you have an adequate number of units for the verall program?		✔			Inspection of facilities/Discussion	
'ype 2: Deep Troughs)o you have an adequate number of units for the verall program?		✔			Inspection of facilities/Discussion	
ıring facilities						
'ype 1: Concrete raceways (20'x80'))o you have an adequate number of units for the verall program?		✔			Inspection of facilities/Discussion	
'ype 2: Concrete raceways (18'x135'))o you have an adequate number of units for the verall program?		✔			Inspection of facilities/Discussion	
'ype 3: Earthen ponds (#25 and #26))o you have an adequate number of units for the verall program?	✔				Not used for coho	
'ype 3: Earthen ponds (#27))o you have an adequate number of units for the verall program?		✔			Inspection of facilities/Discussion	
eening facilities						
)o you meet the approach velocity criteria?		✔			Inspection of facilities/Discussion	
ıre the fish screens regularly cleaned?		✔			Inspection of facilities/Discussion	
)oes the screen mesh meet screen opening criteria?		✔			Inspection of facilities/Discussion	
ıre rearing containers double screened for fish that hould not be released to adjacent water?	✔				Released on station	
dator control facilities						
ıre your predation control facilities effective?		✔			Inspection of facilities/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
d storage facilities and quality control						
)oes the storage of dry/semi-moist/moist foods dry<12%; semi-moist 12-20%; moist >20% moisture) ollow food manufacturer's recommendations?		✔			Inspection of facilities/Discussion	
)oes a regional quality control officer oversee roduction procedures and monitor:						
Verification by feed manufacturer that ingredients meet specifications?				✔	Discussion	Conduct IHOT QA/QC tests for feed preparation
Ensure feed does not contain unwanted drugs or other additives?				✔	Discussion	See above
Analyze ingredients contained in the final food product to ensure that feed specifications have been met?				✔	Discussion	See above
ıre the foods stored and handled according to the ollowing criteria?						
Moist pellets should not exceed 10 °F at point of delivery.	✔				No moist pellets used	
Moist pellets should be removed from freezer just prior to feeding.	✔				No moist pellets used	
Do not leave buckets of feed or feed containers outside exposed to light or heat.		✔			Discussion	
Open bags of feed should be fed within 1 to 2 days except when feeding small groups of fish.		✔			Discussion	
Automatic feeder hoppers and bulk storage facilities should be insulated against excessive temperatures (80°F and above).	✔				No automatic feeders or bulk storage used	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ease facilities						
)o the release facilities ensure that fish are not ubjected to adverse conditions?		✔			Inspection of facilities/Discussion	
lution abatement facilities						
)o the pollution abatement facilities meet all federal nd state regulations (or good engineering practice)?		✔			Inspection of facilities/Discussion	
re pollution abatement facilities operated correctly?		✔			Discussion	
nsportation facilities						
re the transport systems adequate to meet IHOT erformance measures for transportation practices?		✔			Transport systems and drivers provided by another WDFW group. See PM #23	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
odstock selection practices						
s the donor selection process document attached? (PM 40a)	✔				Existing program; does not apply	
Was the donor selection outline followed in selecting ne hatchery broodstock? (PM #40b-c)	✔				Existing program; does not apply	
wning practices						
Were the appropriate number of spawners, male/female atios, and fertilization protocols used? (PM #42c-g)		✔			Review of records/Discussion	
ıbation practices						
specific incubation standards listed in the hatchery rations plan?		✔			Review of IHOT Operations Plan and Hatchery Operation Manual	Develop specific incubation standards for IHOT Operations Plan
incubation practices written?		✔			See above	
ıbation Type 1: Vertical tray (see PM #8) you meet the loading and flow criteria?				✔	Review of records/Discussion	Follow IHOT criteria for incubation flow or revise criteria
ıbation Type 2: Deep trough (see PM #8) you meet the loading and flow criteria?				✔	Review of records/Discussion	See above

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ring practices						
specific rearing standards listed in the hatchery rations plan?		✔			Review of IHOT Hatchery Operations Plan and Washougal Operation Plan	
rearing practices written?		✔			Review Hatchery Operations Plan	
earing Unit Type 1: Raceways (20'x80') see PM #9)						
Do you meet the density and DI criteria?		✔			Review of records/Discussion	
Do you meet the Loading and FI criteria?				✔	Review of records/Discussion	Provide 2,000 gpm more water during late rearing
earing Unit Type 2: Raceways (18'x135' see PM #9)						
Do you meet the density and DI criteria?		✔			Review of records/Discussion	
Do you meet the Loading and FI criteria?				✔	Review of records/Discussion	See above
earing Unit Type 3: Earthen ponds (#25 and #26) see PM #9)						
Do you meet the density and DI criteria?	✔				Not used for coho	
Do you meet the Loading and FI criteria?	✔					
earing Unit Type 4: Earthen ponds (#27) (see PM 9)						
Do you meet the density and DI criteria?		✔			Review of records/Discussion	
Do you meet the Loading and FI criteria?				✔	Review of records/Discussion	See above
olt quality						
Do you produce a high quality smolt?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
h health management practices						
re the monthly hatchery monitoring visits being onducted? (PM #26)		✔			Review of records/Discussion	
re the annual broodstock inspections being conducted? PM #27)		✔			Review of records/Discussion	
there pathogen-free water (PM #5h)and are the anitation procedures being followed? (PM #28)				✔	Review of records/Discussion	See PM #5h
re the following water quality parameters within riteria? (PM #5a-5g)						
Water temperature				✔	Review of records/Discussion	See PM #5a
Dissolved gases			✔		Review of records/Discussion	See PM #5b
Chemistry			✔		Review of records/Discussion	See PM #5c
Turbidity			✔		Review of records/Discussion	See PM #5d
Alkalinity and hardness			✔		Review of records/Discussion	See PM #5e
Nitrite			✔		Review of records/Discussion	See PM #5f
Contaminants			✔		Review of records/Discussion	See PM #5g
re rearing standards being followed? (PM #19)				✔	Review of records/Discussion	See PM #19
re egg and fish transfer/release requirements met? PM #31)		✔			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
s hatchery performance meet requirements lined in the regional hatchery policies and in basin and hatchery plans for the following areas?						
cent smoltification						
Do you measure percent smoltification?				✔	Discussion	Develop smoltification goal and monitor
Do you have a smoltification goal				✔	Discussion	See above
Did you meet the smoltification criteria?			✔		Discussion	See above
ring density (prior to release)						
Did you meet the rearing density criteria just prior to elease?		✔			Review of records/Discussion	
ease condition (at release)						
Did you meet all disease regulations just prior to elease?		✔			Review of records/Discussion	
nber (at release)						
Did you meet the release number goal?		✔			Review of records/Discussion	
at release						
Did you meet the size goal?		✔			Review of records/Discussion	
es of release						
Did you meet the release date goal?		✔			Review of records/Discussion	
ation of release						
Did you release the fish at the specified location?		✔			Review of records/Discussion	
fish reared in the subbasin or acclimated in the basin?						
Vashougal Releases		✔			Discussion	
re the fish reared in the subbasin?						
re the fish acclimated in the subbasin?		✔			Discussion	
Klickitat Releases				✔	Discussion	Provide acclimation for fish released in the Klickitat River
re the fish reared in the subbasin?						
re the fish acclimated in the subbasin?				✔	Discussion	See above

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
nsportation facilities						
)o transportation equipment and personnel receive isinfection before and after use?		✔			Discussion	
; the fish tank interior disinfected using a solution of 00 ppm active chlorine for 30 minutes minimum or ɔrmaldehyde gas generation method (relative humidity f 60% for 2 hrs)?		✔			Discussion	
Is the exterior of the fish transport vehicle disinfected using high pressure steam (115-130°C), high temperature acid, or with 200 ppm chlorine for 30 minutes?				✔	Discussion	Follow IHOT protocols for disinfection of vehicle interiors and exteriors
; the fish transport vehicle (cab) disinfected using 600 pm quaternary ammonia compounds (1.5 ml of 50% tock solution/liter water)?				✔	Discussion	See above
; other equipment disinfected including fish pumps, ets, egg sorters, waders, boots, rain gear, hoses and ther equipment using one of the following solutions?		✔			Discussion	
200 ppm chlorine for 30 minutes 600 ppm quaternary ammonia compound for 30 minutes 200 ppm iodophor solution for 10 minutes		✔			Discussion	
)o personnel wear protective garments when handling sh eggs or cultural water?		✔			Discussion	
)o the fish transport truck/chassis and tank/unit receive n inspection and service prior to the release season?			✔		Discussion	Provide documentation on inspection and service of the transport truck/chassis and tank/unit prior to the release season
; a daily service inspection completed before starting p and leaving for the day?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
nsportation facilities						
)oes the fish transport unit receive an inspection prior) loading?		✔			Discussion	
)oes a pre-loading inspection covering tank water evel, pumps or aerators, oxygen injection system ettings, displacement gauge, and truck loading/hauling ensity tables checked and reviewed occur prior to)ading fish in the transport unit?		✔			Discussion	
)o hauling criteria include checking the fish 45 minutes) 1 hour after loading?		✔			Discussion	
Vhen fish are active and systems are functioning roperly, is the oxygen concentration reduced and ıaintained at approximately 8 ppm?		✔			Discussion	
; water temperature in the transportation unit ıaintained within the 42-48 °F range?			✔		Discussion	Provide documentation of water temperature in the transportation unit
)o fish releasing procedures include the following riteria?						
Releasing the fish at the correct release site or into the correct water body.		✔			Discussion	
Tempering or the difference between the liberation tank and the target water body should not exceed 10°F.		✔			Discussion	
The liberation hose should be angled so that fish gently hit the water. Using a tripod is a method of ensuring the hose will stay at the proper angle.		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
luation practices						
las the hatchery conducted fishery contribution studies):						
Determine the requirements for evaluating and improving management programs?		✔			Discussion	
Develop guidelines that define the geographical area and identify component stocks (hatchery and/or wild) that comprise the management unit?		✔			Discussion	
Develop guidelines that define if the proper stocks of fish are currently being used?		✔			Discussion	
Determine which management units contribute to a specific fishery and the time periods of those contributions?		✔			Discussion	
Determine the relative contributions of the various management units to a specific fishery over the different time periods?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ining practices						
Does the hatchery have a training schedule for its staff?		✔			Review of records/Discussion	
Does each staff member have a personal training plan approved by a supervisor and reviewed annually?		✔			Review of records/Discussion	
Does the hatchery routinely exchange training details between other hatcheries and agencies?		✔			Review of records/Discussion	
Does the hatchery encourage and reward off-duty training of staff?		✔			Review of records/Discussion	
Does the hatchery conduct monthly staff meetings?		✔			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
monthly hatchery monitoring visits being ducted by a qualified fish health specialist as cribed below?						
Conduct visit at least monthly		✔			Review of records/Discussion	
Monitoring conducted by qualified fish health specialist		✔			Review of records/Discussion	
Examine a representative sample of healthy and moribund fish from each lot.		✔			Review of records/Discussion	
Review fish culture practices with hatchery manager.		✔			Review of records/Discussion	
Report finding and results of necropsies on standard form.		✔			Review of records/Discussion	
Recommend appropriate drug or chemical treatment.		✔			Review of records/Discussion	
Summarize fish health status or stock prior to release or transfer to another facility.		✔			Review of records/Discussion	
all of the functions of the hatchery yearly nitoring visits being completed as described below?						
Annually examine each broodstock for the presence of reportable viral pathogens.		✔			Review of records/Discussion	
Annually screen each salmon broodstock for the resence of *Renibacterium salmoninarum*.		✔			Review of records/Discussion	
Conduct inspection by or under the supervision of ualified fish health specialist.		✔			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ıe hatchery following accepted sanitation cedures?						
ıre there any sources of pathogen-free water, especially ɔr incubation and early rearing?				✔	Discussion	Provide pathogen-free water for incubation and early rearing
ıre the hatchery sanitation procedures understood and eing followed as described below?						
Disinfect/water harden eggs in iodophor?		✔			Inspection of facilities/Discussion	
Are foot baths containing disinfectant placed at the incubation facility's entrance and exit?		✔			Inspection of facilities/Discussion	
Is equipment and rain gear utilized in broodstock handling or spawning sanitized prior to its use elsewhere in the hatchery?		✔			Inspection of facilities/Discussion	
Is equipment used to collect dead fish sanitized prior its use in another pond and/or lot of fish?		✔			Inspection of facilities/Discussion	
Is equipment, including vehicles used to transfer fish between facilities, disinfected prior to use with any other fish lots or at any other location?		✔			Inspection of facilities/Discussion	
Are rearing vessels sanitized after fish are removed and prior to introducing a new fish lot or stock?		✔			Inspection of facilities/Discussion	
Are dead fish properly disposed of?		✔			Inspection of facilities/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
water quality parameters being followed?						
re the following water quality parameters within riteria? (PM #5a-5g)						
Water temperature				✔	Review of records/Discussion	See PM #5a
Dissolved gases			✔		Review of records/Discussion	See PM #5b
Chemistry			✔		Review of records/Discussion	See PM #5c
Turbidity			✔		Review of records/Discussion	See PM #5d
Alkalinity and hardness			✔		Review of records/Discussion	See PM #5e
Nitrite			✔		Review of records/Discussion	See PM #5f
Contaminants			✔		Review of records/Discussion	See PM #5g
o to PM #21						
incubation and rearing standards being followed?						
Are the incubation practices following the IHOT incubation criteria? (PM #18)				✔	Review of records/Discussion	See PM #18
Are the rearing practices following the IHOT criteria? (PM #19)				✔	Review of records/Discussion	See PM #19
o to rearing practices PM #18-PM #19						
egg and fish transfer/release requirements met?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ıe hatchery's program outlined in a subbasin ıagement plan? Go to subbasin plan PM #1		✔			Columbia Basin System Planning Production Plan, Mitchell Act, and Columbia River Development Plan	
ıe hatchery operating under a current hatchery rational plan? Go to operational plan PM #2		✔			IHOT Operations Plan and Washougal Operation Manual	
hatchery monitoring and evaluation plan in place? Go to hatchery monitoring and evaluation plan PM #3		✔			CWT and Missing Groups Report	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
s the hatchery program meet requirements blished in the regional hatchery policies and basin planning documents in the following areas: cies, stock, broodstock collection location, odstock numbers, broodstock collection strategy, spawning and egg-take protocols?						
Does the hatchery program meet the requirements for he following?						
Species protocols (PM #1)		✔			Review of records/Discussion	
Stock protocols (PM #1)		✔			Review of records/Discussion	
Broodstock collection location protocols (PM #41b for existing program; PM #39b for new program)		✔			Review of records/Discussion	
Broodstock numbers protocols (PM #42c)		✔			Review of records/Discussion	
Broodstock collection strategy protocols (PM #41b-d for existing program; PM 39b-f for new program)		✔			Review of records/Discussion	
Spawning protocols (PM #42d-e)		✔			Review of records/Discussion	
Egg-take protocols (PM #42f-g)		✔			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
s the hatchery's performance meet requirements						
ined in the regional hatchery policies and in basin and hatchery plans for the following areas: cent smoltification, rearing density, disease						
dition, and the number, size date(s), and location of ase?						
ercent smoltification (PM #22a1)				✔	Review of records/Discussion	See PM #22a1
earing density (PM #22a2)		✔			Review of records/Discussion	
)isease condition (PM #22a3)		✔			Review of records/Discussion	
Number at release (PM #22a4)		✔			Review of records/Discussion	
ize at release (PM #22a5)		✔			Review of records/Discussion	
)ate of release (PM #22a6)		✔			Review of records/Discussion	
ocation of release (PM #22a7)		✔			Review of records/Discussion	
fish reared in the subbasin or acclimated in the basin? PM #22b				✔	"Yes" for fish release at hatchery; "no" for fish released in Klickitat River	See PM #22b
ne release strategy appropriate for the program? PM #22c		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
new programs, has a broodstock collection plan n developed?						
s the broodstock collection plan written?	✔				Existing Program; does not apply	
or a non-captive broodstock program:	✔				Existing Program; does not apply	
Was an unbiased, representative sample collected?						
Was the recommended number of broodstock collected?	✔				Existing Program; does not apply	
or a captive broodstock program:						
Were captive brood progeny excluded as donors for propagating the next generation of the captive broodstock program?	✔				Existing Program; does not apply	
Were full-sib crosses avoided?	✔				Existing Program; does not apply	
s the broodstock collection plan understood and being ollowed by staff?	✔				Existing Program; does not apply	
a new program, was the donor selection outline owed in selecting the hatchery broodstock?						
s a donor selection plan written?	✔				Existing Program; does not apply	
Was the donor selection outline followed in selecting ne broodstock?	✔				Existing Program; does not apply	
Was the target stock recommended in the donor election process actually used?	✔				Existing Program; does not apply	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
existing programs, were the broodstock collection cedures followed?						
s the broodstock collection plan written?		✔			Review broodstock collection plan	
Does the broodstock collection plan follow the uideline:						
Was an unbiased, representative sample collected?		✔			Discussion	
Was the recommended number of broodstock collected?		✔			Discussion	
Were the broodstock collection procedures in hatchery operation plan understood and followed?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
s the appropriate number of spawners, male/female os, and fertilization protocols used?						
ıre the spawning protocols written?		✔			Review of spawning protocols	
ıre daily or weekly spawning logs available?		✔			Review of records	
Vas the appropriate number of spawners used?		✔			Discussion	
)id you attempt to spawn all collected broodstock and ındomize mating with respect to age class, and other ·aits?		✔			Discussion	
Vas the sex-ratio within the limits given in the erformance standards?		✔			Discussion	
Vere the fertilization protocols followed?		✔			Discussion	
: the hatchery needed to reduce the number of eggs etained, was this done by representative sampling of ach male/female cross?		✔			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ıere a genetics monitoring and evaluation program lace?						
; a genetics monitoring and evaluation program vailable?				✔	None provided	Develop approved genetics M&E plan
)oes the plan address the following elements listed in HOT:						
Does the program have elements needed to meet evaluation goals 1-4?				✔	See above	See above
Has a qualified geneticist reviewed and endorsed the program (goal 5)?				✔	See above	See above
Will the program collect the data and maintain the records needed to evaluate compliance on an ongoing basis (goal 5)?				✔	See above	See above
Is the program understood and followed by staff?				✔	See above	See above

Section 4

Remedial Actions

Based on the compliance status for each performance measure, remedial actions were developed. The required remedial actions are organized into five categories. The types of categories range across a spectrum from those actions that are beyond human control, to those that require a change in agency policy or procedures, to those that involve a significant capital cost to put in place. The following are the five types of remedial actions identified under phase 1 of the audit:

The Five Types of Remedial Actions

Type	Description
1	Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery
2	Remedial actions requiring changes in agency policies or procedures
3	Remedial actions requiring changes in monitoring coverage or interval
4	Remedial actions requiring significant capital expenditures
5	Remedial actions that may require significant capital expenditures but are not clearly definable at this time

Remedial Actions at Washougal Hatchery - Coho (Type N)

This section presents the corrective actions required to bring the Washougal Hatchery - Coho (Type N) program into compliance with IHOT performance measures. The remedial actions suggested here are just that, suggestions developed by the Montgomery Watson Audit Team. For some non-compliance areas, other remedial actions could be proposed. The required remedial actions are cross-referenced to each IHOT performance measure that was not in compliance. Where appropriate, the costs associated with the remedial actions are also presented (Table 3).

The cost estimates presented in this section are based on professional experience from similar projects. In most cases, only a lump-sum figure is presented, and detailed take-off lists have not been prepared. The cost estimates are essentially order of magnitude estimates (± 40%).

More importantly, the suggested remedial activities may also present several levels of action. Optional actions have been listed for several problems. These optional actions are desirable for either operational or safety considerations.

Table 3. Remedial Actions Required at Washougal Hatchery - Coho (Type N)

Remedial Action Required	Cost	PMs[1]
Type 1 - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery		
Improve adult returns	----	4c
Install security alarms	----	6
Type 2 - Remedial actions requiring changes in agency policies or procedures		
Improve smolt-to-adult survival	----	4h
Review IHOT temperature criteria for spawning and rearing	----	5a
Conduct IHOT QA/QC tests for feed preparation	----	12
Document compliance with the adequacy of transportation systems to meet IHOT requirements	----	15
Develop specific incubation and rearing standards for the IHOT Operations Plan	----	18-19
Follow IHOT criteria for incubation flow or revise criteria	----	18
Develop smoltification goal and monitor	----	22a1
Follow IHOT protocols for disinfection of vehicle interiors and exteriors	----	23
Provide documentation on inspection and service of the transport truck/chassis and tank/unit prior to the release season	----	23
Provide documentation of water temperature in the transportation unit	----	23
Develop an approved genetics M&E plan	----	43

[1] PMs are performance measures that were extracted from the IHOT 1995 report. The IHOT performance measures are listed in Table 2 (Section 3 of this report) in numerical order.

Remedial Action Required	Cost	PMs[1]
Type 3 - Remedial actions requiring changes in monitoring coverage or interval		
Monitor TGP and record	----	5b
Run analysis for water chemistry parameters, turbidity, alkalinity, hardness, nitrite, and contaminants	----	5c-5g
Type 4 - Remedial actions requiring significant capital expenditures		
Provide disease-free water for incubation and early rearing (10,000 gpm)	$5.7 million	5h, 28
Provide telephone pagers for staff	5,000	6
Provide 2,000 gpm more water to earthen ponds 25, 26 and 27	75,000	19
Provide acclimation facilities for fish released in the Klickitat River	$1.0 million	22b
Type 5 - Remedial actions that may require significant capital expenditures but are not clearly definable at this time		
Improve fry-to-smolt survival	----	4f

[1] PMs are performance measures that were extracted from the IHOT 1995 report. The IHOT performance measures are listed in Table 2 (Section 3 of this report) in numerical order.

Section 5

Hatchery Contribution to Fisheries, Spawning Grounds, and Hatcheries

This section presents the audit findings for the Washougal Hatchery - Coho (Type N) program contribution of adult fish to fisheries, local fisheries, spawning grounds, and hatcheries. Data is reported by broodyear. A broodyear refers to the adult contribution from the eggs produced from a single group of spawning adults. For some species, this may include fish caught as 2-, 3-, 4-, 5-, and 6-year old fish. Because of the return distribution and data processing delays, the complete adult contribution for a given broodyear may not be available until 4 to 5 years after the fish have been released from the hatchery.

Table 4. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries: Washougal Hatchery - Coho (Type N)

Year	Fisheries[1] (Broodyear)	Spawning Grounds[1] (Broodyear)	Hatchery[1] (Broodyear)	Total Combined Contribution[2] (Broodyear)	Smolt to Adult Survival (percent)
1982					
1983					
1984					
1985					
1986					
1987					
1988	2,022	No information provided	342	2,364	2.57%
1989	746	No information provided	311	1,057	1.18%
1990	91	No information provided	23	114	0.12%
1991	19	No information provided	43	62	0.07%
1992					

[1] Data obtained from Missing Production Groups Annual Report or from the Regional Mark Information System database.

[2] Total combined adult contribution; presented when it is not possible to subdivide the contribution into fisheries, spawning grounds, and hatchery contributions.

Section 6

Annual Operating Expenditures

The level and detail of annual operating expenditures varies widely depending on hatchery, operating agency, and funding source. When provided, expenditures were presented in terms of personnel costs, operating costs (power, feed, supplies), capital costs, indirect costs charged to the federal government, third-party costs, and other costs. These cost components were summed to determine a total hatchery annual cost. Based on discussion with the hatchery manager, the percent of total hatchery costs allocated to a given program was estimated. The total hatchery costs and the percent of hatchery costs allocated to a given program were used to compute the cost of a given program. Table 5 shows the annual operating expenses for the Washougal Hatchery - Coho (Type N) program. For programs that occur at more than one facility (as shown on Table 1 in Section 3 of this report), the cost breakdown for the component(s) at each facility is presented in separate tables (Table 5a).

Table 5. Annual Operating Expenses: Washougal Hatchery - Coho (Type N)

Hatchery	1994	1995	1996
1. Washougal Hatchery	**$416,351**	**$411,703**	**$424,914**
2.			
3.			
4.			
5.			
Total Program Costs	**$416,351**	**$411,703**	**$424,914**

The total expenditures for the Washougal Hatchery are presented in Table 6 by program. The detailed breakdown of program expenditures at this hatchery are presented in separate tables (Table 6a, and 6b).

Table 6. Annual Operating Expenses - Washougal Hatchery

Program	1994	1995	1996
1. Tule Fall Chinook	**$196,832**	**$224,623**	**$195,399**
2. Coho (N type)	**$416,351**	**$411,703**	**$424,914**
3.			
4.			
5.			
Total Hatchery Costs	**$613,183**	**$636,326**	**$620,313**

Table 5a. Annual Operating Expenses: Washougal Hatchery - Coho (Type N)

Expenditure Occurring at Washougal Hatchery

Component	1994	1995	1996
Personnel Costs	$141,319	$147,013	$148,792
Operational Costs	$187,137	$192,625	$164,700
Capital Costs	$210,000	$210,000	$210,000
Indirect Costs	$74,727	$86,688	$96,821
Lumped Hatchery Costs[1]			
Lumped Third-Party Costs			
Total Hatchery Costs	**$613,183**	**$636,326**	**$620,313**
Source of Funds			
NMFS	**100%**	**100%**	**100%**
Program Production (lb)	149,256	163,583	177,529
Total Production (lb)	219,881	242,920	259,156
Program as Percent of Total	32.1%	35.3%	31.5%
Program Costs	**$416,351**	**$411,703**	**$424,914**

[1] When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

Table 6a. Detailed Expenditures at Washougal Hatchery by Program

Tule Fall Chinook

Component	1994	1995	1996
Personnel Costs	$141,319	$147,013	$148,792
Operational Costs	$187,137	$192,625	$164,700
Capital Costs	$210,000	$210,000	$210,000
Indirect Costs	$74,727	$86,688	$96,821
Lumped Hatchery Costs[1]			
Lumped Third-Party Costs			
Total Hatchery Costs	**$613,183**	**$636,326**	**$620,313**
Source of Funds			
NMFS	**100%**	**100%**	**100%**
Program Production (lb)	70,625	79,337	81,627
Total Production (lb)	219,881	242,920	259,156
Program as Percent of Total	32.1%	35.3%	31.5%
Program Costs	**$196,832**	**$224,623**	**$195,399**

[1] When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

Table 6b. Detailed Expenditures at Washougal Hatchery by Program

Coho (N Type)

Component	1994	1995	1996
Personnel Costs	$141,319	$147,013	$148,792
Operational Costs	$187,137	$192,625	$164,700
Capital Costs	$210,000	$210,000	$210,000
Indirect Costs	$74,727	$86,688	$96,821
Lumped Hatchery Costs[1]			
Lumped Third-Party Costs			
Total Hatchery Costs	**$613,183**	**$636,326**	**$620,313**
Source of Funds			
NMFS	**100%**	**100%**	**100%**
Program Production (lb)	149,256	163,583	177,529
Total Production (lb)	219,881	242,920	259,156
Program as Percent of Total	32.1%	35.3%	31.5%
Program Costs	**$416,351**	**$411,703**	**$424,914**

[1] When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.